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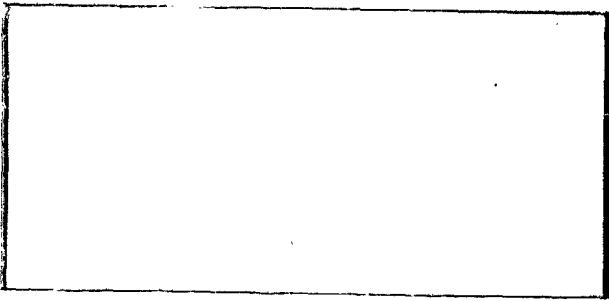
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**DISPLAY
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LITTON INDUSTRIES
ELECTRON TUBE DIVISION
960 INDUSTRIAL ROAD
SAN CARLOS, CALIFORNIA

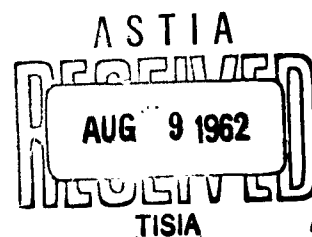
**ANALYSIS OF TYPE 1DP11 CATHODE
RAY TUBE EVALUATING MECHANICAL
AND ELECTRICAL PERFORMANCE**

Contract AF 33(600)-41344

Item 8

**Litton Industries, Display Devices Department
960 Industrial Road, San Carlos, California**

August 3, 1962



ANALYSIS OF TYPE 1DP11 CATHODE RAY TUBE EVALUATING MECHANICAL AND ELECTRICAL PERFORMANCE

SUMMARY

Three National Union Type 1DP11 cathode ray tubes were examined and analyzed in compliance with Para. 1, Supplemental Agreement No. 1, to contract AF 33(600)-41344, dated February 10, 1961. The testing was performed in accordance with the approved test program procedures employed for verifying miniature cathode ray tubes furnished and delivered by Litton Electron Tube Corp. in fulfillment of above contract. Test procedure amendment is stated in detail and the test results are tabulated. The CRT's were arbitrarily labeled #1, #2, and #3, since no serial numbers could be found on these tubes.

The following factors were evaluated: (1) beam centering; (2) resolution; (3) deflection sensitivity; (4) deflection linearity; (5) effectiveness of magnetic shielding; (6) physical dimensions.

(1) Beam Centering

Variations in outside diameters and observed eccentricities of the envelopes made it impractical to locate mechanically the center of the screen. An overlay mask outlining usable screen requirements was prepared photographically. The film mask was centered on the undeflected but focused spot on the tube face. Beam centering was judged acceptable if the area outlined by the mask would be contained within the useful area of the screen.

(2) Resolution

Size of undeflected spot was measured with calibrated microscope. Filament, anode, and focus voltages were carefully adjusted to optimum values recommended for these tubes by their manufacturer and were continuously monitored. In all tubes the grid cutoff voltage was found to be far in excess of the nominal value. In Tube #2 grid cutoff voltage application caused an approximate 3/8" spot deflection on the tube face. Since a spot displacement is wholly undesirable this tube would have to be considered a reject on this one character-

istic alone. The microscope revealed an irregular, coarse grained, screen in all three tubes, with numerous "bright spots" and "dark spaces".

(3) Deflection Sensitivity

The Litton Industries constructed precision test set, utilized successfully in evaluating the tubes furnished under this contract, was employed in conjunction with the photographic mask incorporating control marks. Dual readings were made on an outboard DC voltmeter and the Helipot dial incorporated in the test set and these tests confirm the large variation in $D_3 - D_4$ deflection sensitivities and the gross deviations from nominal values.

(4) Deflection Linearity

Test circumstances were identical to those employed for measuring deflection sensitivity. Uniformity values were computed by the approved formula used for acceptance tests of the Litton tubes.

(5) Effectiveness of Magnetic Shielding

A Mu-metal shield was employed for testing the CRT's which proved to be effective in circumventing the effect of any stray magnetic fields around the test setup.

(6) Physical Dimensions

Outside diameters of the glass envelopes were measured by micrometer in close proximity of the display screen. Maximum diameters are logged and tabulated.

$E_a = 600$ V DC
 $E_f = 6.3$ V AC

DATA ON MINIATURE CATHODE RAY TUBES
 ELECTRICAL TEST RESULTS: 1DP11

TEST	Nominal	Units	TUBE NUMBER		
			#1	#2	#3
SPOT SIZE (UNDEFLECTED)	--	Mill	21	20	22
SPOT POSITION			OK	OK	OK
FOCUS VOLTAGE	150	V DC	150	150	150
GRID CUTOFF VOLTAGE	-40	V DC	-60	-55	-52
DEFLECTION FACTOR $D_1 - D_2$	280	V/in.	332	334	334
DEFLECTION FACTOR $D_3 - D_4$	280	V/in.	342	231	237
DEFLECTION FACTOR UNIFORMITY $D_1 - D_2$	0.300	Ratio	.307	.319	.340
DEFLECTION FACTOR UNIFORMITY $D_3 - D_4$	0.300	Ratio	.297	.310	.350
ANGLE BETWEEN TRACES	90	De- grees	OK	OK	OK
OUTSIDE DIAMETER NEAR SCREEN	.875 max.	IN	.840	.842	.834